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**CHEMICAL  
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CRDEC-SP-054

**HIGH SCHOOL APPRENTICESHIP**

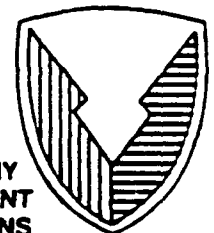
**ELEVEN YEARS OF BENEFITS TO THE  
U.S. ARMY CHEMICAL RESEARCH, DEVELOPMENT AND  
ENGINEERING CENTER**

Robert R. Gavlinski  
PHYSICAL PROTECTION DIRECTORATE

September 1992

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**U.S. ARMY  
ARMAMENT  
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Aberdeen Proving Ground, Maryland 21010-5423

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# REPORT DOCUMENTATION PAGE

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11. SUPPLEMENTARY NOTES As of 1 October 1992, the U.S. Army Chemical Research, Development and Engineering Center (CRDEC) will become the U.S. Army Edgewood (continued on page 2)					
12a. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution is unlimited.				12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words) This report summarizes the High School Science and Engineering Apprentice Program (SEAP) for 11 years at the CRDEC. Data is presented for each year to include the high schools that were represented and quantity of students selected from each school. Summary information is presented on the titles of the research activity for the students. The initial version of this report was assembled as a presentation for a Conference on Science, Math and Engineering (SME).					
14. SUBJECT TERMS Apprentice SEAP High school Student SME NRL GWU				15. NUMBER OF PAGES 42	
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11. SUPPLEMENTARY NOTES (Continued)

Research, Development and Engineering Center. In September 1993, this program will be formally transferred to the U.S. Army Chemical and Biological Defense Agency Business Office under Hayward Hulick.

## PREFACE

The work described in this report was authorized under a DoD initiative for training high school students in science and engineering. The funding source was an overhead account. This work was started in June 1981 and completed in September 1992.

As of 1 October 1992, the U.S. Army Chemical Research, Development and Engineering Center will become the U.S. Army Edgewood Research, Development and Engineering Center. In September 1993, this program will be formally transferred to the U.S. Army Chemical and Biological Defense Agency Business Office under Hayward Hulick.

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### Acknowledgments

The author gratefully acknowledges the support of his team members in the administration of the program, Eleanor P. Grove and Timothy S. Baker. Special thanks is given to Anthony J. Saponaro, who was a mentor for all 11 years of this program. Appreciation is extended to two student contractors, David Johns and Daniel Miller for assistance with data reduction from multiple sources.

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## HIGH SCHOOL APPRENTICESHIP

### ELEVEN YEARS OF BENEFITS TO THE U.S. ARMY CHEMICAL RESEARCH, DEVELOPMENT AND ENGINEERING CENTER

The U.S. Army Chemical Research, Development and Engineering Center, Edgewood Area, Aberdeen Proving Ground, MD, has been an active participant in the High School Apprentice Program since 1981 when we had a modest start in sponsoring four students in our laboratory. I have been the single coordinator and major impetus in convincing our working scientists and engineers of the worth of the program.

I joined the already established program of the Naval Research Laboratory (NRL) in the Washington, DC, area and helped to establish a similar program at our laboratory. Mr. George Kelm of the Ballistic Research Laboratory (BRL) and I worked complimentary programs in our respective laboratories. Dr. Marilyn Krupsaw, Lin as she is called, is our primary point of contact in helping us to join the DC program.

Our goal was to offer local high school students an opportunity to spend 8 weeks during the summer in a laboratory atmosphere. They would perform experiments or other relevant work experience and then write a paper on the subject. For this effort, we established a stipend of \$1,000 to cover their costs. To carry out the tasks with minimal amounts of paperwork, we were very specific to isolate this program from that of the normal summer hire program.

Our program grew over the years to the point where we were sponsoring at least 50 students each year. The operating technical staff was instrumental in selling the program to more mentors. They saw the worth of the student and heard the accolades of the mentors (Appendix A). This was augmented with the published reports of the students in an CRDEC Special Publication (SP). This SP was sent to all of the participating students, the high school principals, and the local legislators.

Our goal in all of the years was to select the most promising students. These students were chosen for their acceptable school grade point average, nomination statements from high school faculty, and personal statements from the students. In all of the years, we would get about three times as many applicants as we would appoint - 150-50.

There was no overt effort to contact specific schools or to appoint minorities, males, or females. The entire submission of applications was made available to all of the mentors: they chose the student based on credentials. Follow-up

interviews by the mentor and I augmented the selection process. Sons and daughters of the civilian and military families were afforded equal treatment in the selection/rejection process.

It became obvious that the mentors became involved with individual schools and advertised the program to the students at those schools. This became the primary reflection of our stewardship to the school system.

The following tables summarize the program over all of the years that we kept data. The years 1981 through 1983 were difficult to reconstruct but I did the best to find the statistics.

Tables 1 and 2 summarize the program for all of the 11 years. Here, total student participation, breakdown by schools, division by male and female, and where we could capture it, minority classifications. Table 2 shows where the students came from within the school systems.

Table 3 summarizes the early years, showing that the apprentices did go to college and did pursue a science and engineering degrees. This information is derived from our personal knowledge of the students as we talk to them during recruiting trips or hear from them by correspondence. There was no survey made of all of the students mainly because there is no mechanism nor charter to do so. This area can become a basis for a future study.

Table 4 illustrates some results we have gained from the students in accomplishing our mission. It is their studies and data collection that has enabled us to accomplish some of these tasks. This is only a summary of some positive results we can document. Many other tasks were accomplished. Other tasks are formally documented in CRDEC Special Publications CRDEC-SP-85003, CRDEC-SP-85010, CRDEC-SP-86022, CRDEC-SP-87025, and CRDEC-SP-028 and are summarized in Appendix B.

We extended all of our facilities and equipment to these students. Access to the electronic mail system allowed our first crisis to develop in 1987. Until that time, each student was given access to the CRDEC electronic mail system where they were allowed to collect their data and formulate their draft report. With this system, it was easy to find the reports, edit them, and then submit them for publication. This gave us a 2-month turn around in publishing the reports.

The crisis manifested itself when CRDEC Systems Security discovered that the students were "hacking" on the computer system with trading of passwords, improper log on, sending false messages, and transmitting personal greetings during peak demand for computer times. This problem existed at



TABLE 1

# QUANTITY OF STUDENTS

DISTRIBUTED BY SEX, MINORITY STATUS AND ACADEMIC GRADE

YEAR	81	82	83	84	85	86	87	88	89	90	91	92
TOTALS	4	14	39	36	50	60	81	53	50	46	51	59
MEN	3	7		20	30	31	39	32	28	27	33	38
WOMEN	1	7		16	20	29	42	21	22	19	18	21
MINORITY	0	0		3	3	3	7	10	11	8	11	15
MAJORITY	4	14		33	47	57	74	43	42	38	40	44
GRADE 12	3	10		12	12	19	37	24	12	12	17	20
GRADE 11	1			14	14	37	34	22	25	21	23	19
GRADE 10		4		6	7	2	8	7	5	9	8	15
GRADE 9										2	3	5
OTHER										1		
TOTALS	4	14	39	36	50	60	81	53	53	46	51	59
YEAR	81	82	83	84	85	86	87	88	89	90	91	92

TABLE 2

# QUANTITY OF STUDENTS

DISTRIBUTED BY HIGH SCHOOL

YEAR	81	82	83	84	85	86	87	88	89	90	91	92
ABERDEEN				1	3	4	9	2	1		1	1
BALTIMORE LUTHERAN				1	1	1		1		1		
BALTIMORE POLYTECH				3								
BEL AIR				1	1	5	7	6	10	9	5	5
BOHEMIA MANOR									1			
CALVERT HALL								1	2			2
CENTENNIAL										1	2	1
COMMUNITY				1	1							
C. MILTON WRIGHT				6	7	14	23	14	9	5	7	8
DUNDALK				1	1							
EASTERN VO-TECH										1		
EDGEWOOD				4	3	2	6	3	6	8	12	9
FALLSTON				3	7	9	7	2	5	7	2	2
FRANKLIN CITY								1				
GILMAN					1		1	1				1
HARFORD CHRISTIAN				1	1	2	1					
HARFORD TECH HIGH												1
HAVRE DE GRACE						2	3	2	1	3	2	3
JOHN CARROLL				4	5	4	7	5	4	4	6	2
JOPPATOWNE					4	4	6	2		2	4	10
KENWOOD				1								
LAKE BRANTLEY					1	1	1					
LOCH RAVEN								1	1			
LOYOLA HIGH								2			1	
MT. HEBRON								1	1			
NORTH EAST							1			1		1
NORTH HARFORD				2	4	3	5	4	3	1	2	2
PERRY HALL					3	3	1				3	2
PERRYVILLE				4	4	2	2	3	3		1	5
PIKESVILLE									1	1	1	1
RED LION												1
RIISING SUN				3	3	3				2	1	1
SEVERNA PARK									1			
SUSQUEHANNOCK								2	2			1
WEST LAUDERDALE						1						
WOODLAWN							1					
TOTAL	4	21	39	36	50	60	81	53	53	46	51	59

TABLE 3

## CRDEC APPRENTICES - CURRENT STATUS IN COLLEGE CAREER

YR	NAME	SCHOOL	YEAR	CAREER
82	GAVLINSKI	VPI	GRADUATE	ME AT AMSA
86	ENGLISH	VPI	GRADUATE	ME
	GAVLINSKI	ST MARY	GRADUATE	RESEARCHER
	HATFIELD	VPI	GRADUATE	ME AT CRDEC
	OUELLETTE	VPI	GRADUATE	ME AT CSTA
	REES	BOSTON U	GRADUATE	ECONOMIST
	SAPONARO	U OF MD	GRADUATE	BUSINESS CPA
	SCAVNICKY	DELAWARE	GRADUATE	U OF DEL GRAD SCHOOL
	STROVEL	SHEPHERD	GRADUATE	JOURNALISM
87	GRAYSON	VPI	GRADUATE	GEOLOGY
	MONKS	TOWSON	GRADUATE	BUSINESS
	NOVAK	NAVAL ACAD.	SENIOR	NAVAL
	NUESSELEIN	VPI	GRADUATE	U OF ILL PHILOSOPHY
	RENARD	PITT	GRADUATE	EE AT BRL (CRAY)
	VINCENTI	ST MARY	GRADUATE	BIOLOGY & PRE-MED
	VANDENBOCHE	LOYOLA	GRADUATE	BIOLOGY
88	EICHENSHER	HOPKINS	GRADUATE	EE
	FIALA	CARNEGIE MELLON	GRADUATE	MATH
	SCHMIDT	OBERLIN	JUNIOR	PHYSICS
89	GERVASONI	LOYOLA	JUNIOR	BUSINESS
	RICKETTS	VILLA JULIE	FRESHMAN	SCIENCE
	STUEMPFLE	SHEPHERD	JUNIOR	MATH
	STUMP	SALISBURY	JUNIOR	PHYS ED
	VERVIER	UVA	JUNIOR	BIOLOGY

TABLE 4

## CRDEC APPRENTICE ACCOMPLISHMENTS

YEAR	NAME	ACCOMPLISHMENT
1987	Kang	Prepared Government Patent Application for a Filter
1986	Hatfield Knight Rees Ouellette Cayce Albert Gavlinski Scheuren	Prepared and Mapped Bacterial Planned DNA Categorized Catalytic Oxidation Reactors Evaluated Military Respirators Jet Turbine Dissemination Techniques Installed 4-DEC Computer System Program Toxicity Effects of Brass on Plants and Soils Evaluate Prior Escape Experiences on Rats Evaluate Lectin Enzyme Assay Detection Test
1988	Baesden Devivo Eichensehr	Evaluate Sub Munition Ejection Program Revision of Bacteriological Media Surveillance Testing of Butyl Cloth

both CRDEC and BRL and was traced to one or two students who were clearly bent on disruptive behavior. Within CRDEC, 13 students were identified and terminated from the program. These students were terminated at the 6th week of the program, causing forfeiture of half the stipend. Parental furor erupted, and upon reporting the problem to an inquiry by the Commanding General, each parent and student was allowed a hearing with me. At that hearing, I presented the printed examples of the students' transgressions to the parent, and each student accepted the fault. Each parent was offered the opportunity to accept responsibility for their child, and the matter was resolved with each student finishing the program with pay.

In all of our projects, we measured how much work was required to accomplish a task in man years. For the apprentice program, this translates into man weeks where every year each student provides eight man weeks of effort. The CRDEC uses the normalized rate of \$60 per man hour or \$2,400 per man week. Here we illustrate that we have leveraged the \$1,200 8-week stipend by 16. That compares the \$1,200 paid for 8 weeks to a full staff cost of \$19,200. That is a sizeable return on investments.

The facts of the program can be manipulated in many ways; but, the conclusion to all of the information is that the CRDEC and all of the participating staff have provided STEWARDSHIP to the community. One needs no greater reward than that.

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## APPENDIX A

TOTAL: 196

MENTOR PARTICIPATION

('84 - '92)

1.	GAVLINSKI	11 YEARS
2.	ARMSTRONG	8 YEARS
3.	SAPONARO	8 YEARS
4.	FAMINI	7 YEARS
5.	WEISS	7 YEARS
6.	CHENG	6 YEARS
7.	CLARK	6 YEARS
8.	FRITCH	6 YEARS
9.	MARCHAND	6 YEARS
10.	YEH	6 YEARS
11.	ASHMAN	5 YEARS
12.	CARRIERI	5 YEARS
13.	DEFRANK	5 YEARS
14.	FITZGERALD	5 YEARS
15.	HSU	5 YEARS
16.	WEBER	5 YEARS
17.	ALTHOUSE	4 YEARS
18.	CHURCH	4 YEARS
19.	COMPTON	4 YEARS
20.	JAMES	4 YEARS
21.	KRAYBILL	4 YEARS
22.	MITCHELL	4 YEARS
23.	NOVAK	4 YEARS
24.	STARKE	4 YEARS
25.	SCHLEIN	4 YEARS
26.	VALDES	4 YEARS
27.	YOUNG	4 YEARS
28.	ARCA	3 YEARS
29.	BATELKA	3 YEARS
30.	DITILLO	3 YEARS
31.	GIER	3 YEARS
32.	GROSS	3 YEARS
33.	GOODE	3 YEARS
34.	HUERTAS	3 YEARS
35.	KINNE	3 YEARS
36.	KRISHNAMURTHY	3 YEARS
37.	LAWHORNE	3 YEARS
38.	LIEBENBERG	3 YEARS
39.	LEE	3 YEARS
40.	MUMFORD	3 YEARS
41.	MILLER	3 YEARS
42.	SNYDER	3 YEARS
43.	SHETTERLY	3 YEARS
44.	SCHMIDT	3 YEARS
45.	WHITE	3 YEARS
46.	WASEL	3 YEARS

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APPENDIX B  
SEAP STUDENT REPORTS

AUTHOR	TITLE
1. Timothy English	Analytical Techniques of Sorbents and Chemical Species Identification
2. Denise Hammond	Direct-Acting Chromogenic Detector Reagents
3. Samuel Hsu	The Physiological Effects of Pinacolyl Alcohol on Rats
4. Jack Peters	Developments in Air Plasma Studies
5. Jeffrey Adams	Physical Property Testing of the XM40 and the M17 Protective Masks
Lisa Balliet	
John Jordan	
Gregory Tate	
6. Kristin Call	Physical Protection
7. Charles Carter	Video Image Digitizing Analysis
8. Clare Ewald	Branch Record Automation
9. Christopher Jarusek	Technical Assessment of the Fit of the M17A1 Protective Mask Versus Facial Measurements
10. Daniel Kaplan	Characterization of the Model 260 Aerosol Generator
11. William McCullough	Prototype Maximization and Nonsubjective Sizing
12. John Prichard	Developmental Adhesive Testing Procedure
13. Paul Solomon	Spare Parts Analysis for Cost Reduction
14. Charles King	Simulant Analysis Using Gas Chromatography
15. John Albert	Computer Entry/Exit Model
16. Brian Brooks	Surface Reflection Three Dimensional Display
17. Patrick Engram	Palantiri
18. Maria Horsey	Data Base Program
19. John Kelley	A Curve-Fitting Program for Behavioral Studies
20. Ingrid Kohlstadt	Computers and Engineering Support
21. Stephen Saponaro	Computer Aided Design/Computer Aided Manufacture
22. Kerry Foster	The Effects of Physostigmine on Treadmill Performance in Rats
23. Lori Foster	A Preliminary Evaluation of the Baseline Running Wheel Activities of the Rat
24. Kristin Gavlinski	Veterinary Resources Support for Toxicology Research and Testing
Jenean Tulley	
25. Victoria Linkous	Immunochemical Techniques for Detection and Identification of Biological Materials
26. Michelle Miller	Preparation of Rat and Hamster Microsomes and Comparing Them Using the Ames Assay
27. Amelia Pare	The Effects of Physostigmine on Open-Field Activity
28. Mark Pare	Daily Activity Patterns in Ferrets
29. Roger Richmond	Teratogenicity of Hydra Attenuata and Xenopus Laevis as a Result of Toxic Insult
30. Jennifer Vervier	Antimicrobial Activity of Earthworm Coelomic Fluid
31. Vicki Wolff	Immunochemical Techniques for Detection and Identification of Biological Materials
32. Denise Walker	M51 Charcoal Dusting Test

AUTHOR	TITLE
1. Patrick Engram	IR Smoke Pots
2. Denise Hammond	Triple Quadruple Mass Spectrometry of Dimethylmethylphosphonate
3. Kelly Harmon	Drop Fate
4. Ingrid Kohlstadt	Ammonia Off-Gassing and Content Tests on Impregnated Carbons
5. Kathleen Sindt	Vapor Measuring Technique
6. John Yeh	The Making and Studying of Flakes
7. Jeffrey Adams	Testing Protective Masks/Ultrasound Research/
Kevin Lugo	Testing Burster Cases
Lisa Balliet	
John Jordan	
8. John Cook	Design and Fabrication
9. Steven Yerman	The Optimization of the XM49 Filter
Christina Hull	Fabrication Process
10. Michael Rees	Attenuator Test of the M81
11. Barbara Starkey	State of the Art Filter Life Test Evaluation
12. Christopher Strovel	Turbulence Testing in a Subsonic Wind Tunnel
13. Todd Robinson	Testing of Masks and Hoods
14. William McCullough	Probe Location Study
15. Peter Albert	Testing the Toxicity of Brass Powder on the Environment
16. Elise Arle	Air Purification by Catalytic Oxidation
17. Steven Brown	Triple Quadruple Mass Spectrometry of Dipropylene Glycol Monomethyl Ether
18. Mark Unger	Isolation and Purification of Enzymes
Tammy Kile	
19. Michelle Miller	Using the Ames Assay to Screen Chemical Compounds
20. Robert Mroz	Chemical Reconnaissance: A Matter of Safety
21. Brian Nuesslein	A Summary of My Work Experience
22. John Packard	Soil Porosity: A Hurricane of Methods, A Drizzle of Data
23. Jennifer Vervier	DFPase from a Bivalve Mollusk ( <i>Rangia cuneata</i> )
24. Brian Brooks	Computer Modeling and Statistical Analysis of Reflectance Data
25. Charles Crizer	Computer Modeling of Infrared Detectors
26. Clare Ewald	ACADA Test Results Data Base System
27. Matthew Gross	Program Debugging
28. Maria Horsey	Test Data and Linear Regression Program
29. Jeffrey Leo	DOD Apprenticeship: Final Report
30. Melanie Appel	Viewgraph
Debbie Robbins	
31. Stephen Root	Apprenticeship within the Information Services Branch at CRDC
32. Greg Tate	Computer Aided Design
Stephen Saponaro	
33. Mark Pare	Preparation of Equipment and Computer Programs for Evaluating a Behavioral Training Method in Rats
34. Michelle Renard	Decontamination of Chemical Agent Simulants by Means of Jet Engine Exposure
35. Kerry Foster	Conditioning a Group of Rats for a Learning and Performance Behavioral Test

AUTHOR	TITLE
1. Paul English	Transducer Calibration
2. Kevin Lugo	Vibration Tables/Grenade, Hand, and Smoke , M18
3. Christopher Strovel	Comparison of Data Reduction Techniques for Wind Tunnel Testing
4. Susan Knight	Air Purification by Catalytic Oxidation
5. Dyer Bennett	A Summer Work Experience in the Physical Protection Directorate
6. Steven Brown	My Summer at Decon Systems
7. Cynthia Bucci	Technical Data Files
8. Christine Castle	Robotically Automated Sample Handling Laboratory
9. Dawn Gilbert	Producibility Apprentice
10. Denise Hammond	Comparison of Electron Ionization and Atmospheric Pressure Ionization Mass Spectrometry
11. Thomas James	Systems Engineering: The Silo
Jeffrey Franz	
12. Paige Killian	Summary of a Work Experience in TD/CM
Sandra Samples	
Danielle Stephenson	
13. Thomas McMaster	NBC Sanator
14. Michael Rees	Evaluation of Military Respirators
15. Todd Robinson	Respiratory Testing
16. Michael Scavnicky	Effects of Different Flowrates and Humidities on C2 Canisters
Craig Proaps	Computer Aided Design
17. Greg Tate	
Stephen Saponaro	
18. Denise Williams	Special Summer Projects in Support of Jet Engine Decontamination Studies
Hae Jun	Working at CRDEC
19. Willard Barker	Preparing and Mapping of Bacterial Plasmid DNA
20. Craig Hatfield	Experimental Measurements of the Spreading of Chemical Surety Materials on Solid Surfaces
Gary Peters	Technology Group Apprentice
21. Robyn Holbrook	Comparing Spread Factors
Christina Houseknecht	
22. Patricia Kaminski	Jet Turbine Dissemination/Analytical Technique
23. Deirdre Haywood	Quantitative Studies of the Fluorescence Enhancement Phenomenon Produced by Certain Detector Reagents When They are Contacted by Solutions of Organic Compounds
Theresa Keyes	Molecular Modeling of Opiate Compounds
24. Christine Goeller	Chemical Inventory and Data
Danielle Ouellette	Methyl Salicylate Diffusion
25. Girish Munavalli	Compiling a Database
	Installation of DEC Computer Systems
26. Todd Nelson	Apprenticeship within the Producibility Branch, CRDEC
27. William Parker	My Involvement with the Apprenticeship Program
28. Kathleen Sindt	Learning and Using the Intel Computer Calculator
29. Jeffrey Burgee	
30. Gail Cayce	
31. Michael Franks	
32. Shawn Hannan	
33. Brian Nueslein	
34. Debbie Robbins	

AUTHOR	TITLE
35. Stephen Root	Computer Applications within the CRDEC Technical Library
36. Janet Sisk	Forms Management
37. Mike Thomassy	Learning Fortran and Using a CAD System
38. Peter Albert	Toxicity and the Environment
Jane Seiter	
39. Mark Pare	The Effect of Prior Escape Experience in Rats
Kristin Gavlinski	on Subsequent Conditioning to a Nondiscriminated Avoidance Schedule
40. Lara Holly	Bioavailability of Chromium from Whetlerite Dust
41. Heidi Reich	Enzyme Activity in Thermophiles and Halophiles
42. Amy Richeson	Environmental Studies and Laboratory Techniques
43. Rebeka Deas	Receptor Systems as Screens for Toxicity:
Kimberly Rodgers	Action of Organophosphates and Organochlorines
44. John Scheuren	Lectin Enzyme Assay Detection Test for Ribose
	and Isolation of DNA and RNA
45. Mark Unger	Pyruvate Kinase
46. Maria Wall	Biotech

AUTHOR	TITLE
1. Donna Clem	Generation of Cubic Sodium Chloride Aerosol Particles
2. Shavit Birenvige	Efficiency Testing Of An Electrical Aerosol Size Analyzer
3. Kristin Carmean	Diffraction of Infared Spectra on Polystyrene Spheres
4. Christina Houseknecht	Analysis by Pyrolysis/Gas Chromatography with Subsequent Data Processing
5. Christine Kutchey	Fiber Optic Detection
6. Brian Nueslein	Characteristics of Aerosol Generation and Detection
7. John Powell	Dynamic Measurements of Contact Angles
8. Dawn Simon	Temperature Effects on BPL and ASC Carbons
9. Christopher Strovel	Hot-Wire Anemometry
10. Sindhu Abraham	The Production of the M40 Mask and the C2 Canister
11. Dyer Bennett	Physical Protection Equipment Research
12. Christopher Caudill	Improved Chemical/Biological Agent Decontaminant
13. Jennifer Davis	Corrective Lens Study for Protective Masks
14. John Deas	M43 Mask, Producibility Engineering
15. Christine Goeller	IPE Challenge Testing
16. Deirdre Haywood	XM55 Large Area Screening System
17. Thomas James	NBC Detection Systems on the MICAD and CADNET
18. Steven Kang	Government Patent of the Product Improved M8A3/MI3A1 One-Man Gas Particulate Filter Unit
19. John Loper	Compression Pad Problems
20. Kevin Lugo	Developmental Test Procedures
Donna Vincenti	
21. Thomas McFall	MICAD/CADNET Testing
22. Thomas McMaster	NBC Sanator Parts List
23. Kevin Mish	XM55 Reliability Test Plan
24. Karen Poole	NBC Warning Network Testing in MICAD/CADNET Projects
25. Mark Radovich	Apprenticeship at Screening Smoke
26. Todd Robinson	Respiratory Testing
27. Michael Scavnicky	Speech Intelligibility in American Protective Masks
28. Trevor Smith	Preparing a Chemical Detector for Testing
29. Diane Sparks	Improved Chemical/Biological Agent Decontamination Project
30. Scott Wooddell	RASTI Test System & Voice Amplification
31. Lorie Sue Fleming	Charcoal Absorption
32. Wendy Hinton	Hydra Attenuata System for Detection of Teratogenic Hazards
33. Sandy Hsu	Thin Layer Chromatography, Organic Synthesis, and Isolation and Purification of Enzyme
Kelley Knight	Modification in a System for Computer-Assisted Chemical Inventory
34. Lara Holly	Fluorescence Enhancement Phenomenon Produced by Certain Detector Reagents When Contacted by Solid Organic Compounds
35. Girish Munavalli	Molecular Modeling of Opiate Compounds
36. Todd Nelson	

AUTHOR	TITLE
37. Lisa Priborsky Alex Framarini	The Effects of Chemicals on Sperm Cell Motility
38. Glen Wischhusen	Referee Standards
39. Marie Yeh	Catalytic Oxidation of Monomethylamine
40. Michael Adams	ICD Transmission Log
41. J. Steve Anthony	Computer Aided Design as Learned on Computervision
42. Willard Barker	Inside the Data Management Office
43. Steven Danielson	Working at PAD
44. Mary Craig Bonnie Grayson	Computer Programs for the Collection, Analysis, and Formatting of Behavioral Data
45. Michael Bredehoeft	Computer Systems
46. Gail Cayce	Document Instructions for File Transfer Communications and Create Project Schedules with Project Management Software
47. Paige Kilian Danielle Stephenson	Technical Data/Configuration Management Systems and Operations
48. Stephen Levin	Programming a Hewlett Packard 9845 B
49. David Maillett	Learning, Programming, and Teaching on an IBM-PC
50. Kevin Matthai	The Automation of the Business Clearance Memorandum
51. Christopher Novak Jami Hershfeld	Compiling a Data Base and Program to Process the Data
52. Robert Price	Researching the Effects of ESD on Integrated Circuits and Creating a Baseline Cost Estimate Worksheet Using 20/20 Spreadsheet Modeling Program
53. Kenneth Renard	Computer Programming for Office Automation
54. Debbie Robbins	Writing a Calculator Program for the VAX
55. Dorothy Spurlin	Creation of a Data Base File
56. Janet Sisk	Accessing the UNIX System
57. Michael Thomassy	Programming in C
58. Marie VandenBosche	Computer Applications within the CRDEC Technical Library
59. Carla Williams	Munitions Surveillance Report Database
60. Mark Gilbert	Robotically Automated Laboratory
61. Peter Albert	Organization of Veterinary Services Archives
62. Tim Braue	Techniques in Electron Microscopy and Pathology
63. Bonnie DeVivo	Enzymatic Decontamination
64. Zoya Fansler Tara Redican	Enzymology Research
65. Craig Hatfield	Determining Location of Gene Coding in a Thermophilic Bacteria
66. Christopher Lee	In Vitro Testing of Irritancy of Substances Foreign to the Eye
67. Deborah Lovelace	Kinetic Analysis of Muscarinic Receptor Binding in Cortex, Hippocampus, and Striatum
68. Joann Monks	The Development of an Enzyme Inhibition Assay
69. Jeanne Nuzman	Detection of Toxins
70. Cristin O'Rourke	The Effects of Carbachol on Cultured Embryonic Chick Retinal Cells

AUTHOR	TITLE
71. Danielle Oullette 72. Padma Rajasekhara 73. Cheryl Sweeney	Effects of Pyridostigmine on the Molecular Weight Forms of Cholinesterase in Rats Cellular Protein Determination as an Alternative to Animal Testing Inhibition and Aging Rates of Phosphorinanes on Cholinesterase



AUTHOR	TITLE
1. Sindhu A. Abraham	The Production of the M40 and M30 Masks
2. W. Troy Baisden	Submunition Ejection Program for Adexjam with T-Rad
3. Jonathan Batchelor	Technical Data Preparation
4. Shavit Birenvice	Analyzing Aerosol Particles
5. Gregory M. Blake	Component Categorization of the XM22
6. Leslie Bowers	Automatic Chemical Agent Alarm
7. Todd Coen	Collective Protection Equipment
8. Darren Colvin	Isolation and Purification of Malic
Mary Beth Craig	Dehydrogenase from Beef Heart
Bonnie Grayson	Hexavalent Chromium Content of Whetlerite
9. Steven Danielson	Computer-Assisted Analysis of Sperm Cell
June Hong	Motion for Toxicological Testing
10. Bonnie DeVivo	Revision of Bacteriological Media for Isolate 6-5
11. Andrew Dunn	A Programatic & Policy Profile of the U.S. Army Chemical Corps -- 1946 to Present
12. Phillip Eichensehr	Operations in Chemical Surveillance
13. John Fiala	Creation of a Logic-Based Threat Evaluator to Determine the Probability of a Bio. Attack
14. Charles Guido	A Prototype Database for the Compendium of Naturally Produced Hazardous Substances
15. Jonathon Heitz	Screening Plasmid DNA in Halophiles
16. Heidi Hudler	Literature Search on the Concerns of Ozone Depletion
17. Jennifer Hughey	Graphic Capabilities
Donna Vincenti	
18. Steven Kang	M43 & M40 Masks Producibility Engineering
19. Judith Kim	Adaptation of SP2/O-Ag14 Cell Line to Bovine Calf Serum-Supplemented Medium
Christine Kutchev	
20. Christopher Lee	Using the Eyetex Screen System
21. Michelle Lee	Comparison of Monoclonal Antibodies and Polyclonal Antibodies for Use in Immunoassays
Shirley Leung	
22. Michele Martin	Producibility of Modular Collective Protection Equipment
23. Timothy McAveney	Analog Circuitry: The Square Law Detector
24. William McGann	Molecular Structure Optimization and Data Basing
25. Anoop Munavalli	Comparison of the Mutagenic Responses in Two Potential Mutagens
26. Christopher Novak	Master Industrial Engineering Plan Chart Production
27. Karen Poole	Chemical Agent Detection Network
28. Lisa Priborsky	Screening Tests for Detector and Capture Antibodies
29. Robert Price	Project Management and Documentation
30. Andrew Ptak	Project Management Systems
31. Mark Radovich	Apprenticeship at Screening Smoke
32. Tara Redican	Validation of Sampling Procedures for Methyl Salicylate
33. Kenneth Renard	Summer Apprentice Report
34. Vicki Roberts	Anthropometric Survey

AUTHOR	TITLE
35. Mike Scavnicky	Using Pure-Tone Frequency Tests To Determine the Speech Transmission of Various Masks
36. Karl Schmidt	The Use of Tektronics Computer Aided Design Software: TekniCAD
37. Steve Schriver	Failure Analysis of an In-House Project
38. Aaron Shadis	Modification of CADDS System
39. Clifford Smith	Testing of Protective Masks in a Test Chamber Complex
40. David Sorkin	Computer Aided Design
41. Ronald Stump	The Fielding and Spare Parts Effort of the M17 Sanator
42. Margeret Thomas	Computer Applications in the Physical Protection Directorate
43. Steven Unger	MolDIS: A Molecular Graphics Package for the Hewlett Packard 9845B Microcomputer
44. Donna Williamson	Lectins and Their Use in Detecting Viruses and Bacteria
45. Thomas Wood	Devolopment of a Database Inventory of Equipment Catalogs and Modification of a Video for Marketing a Program

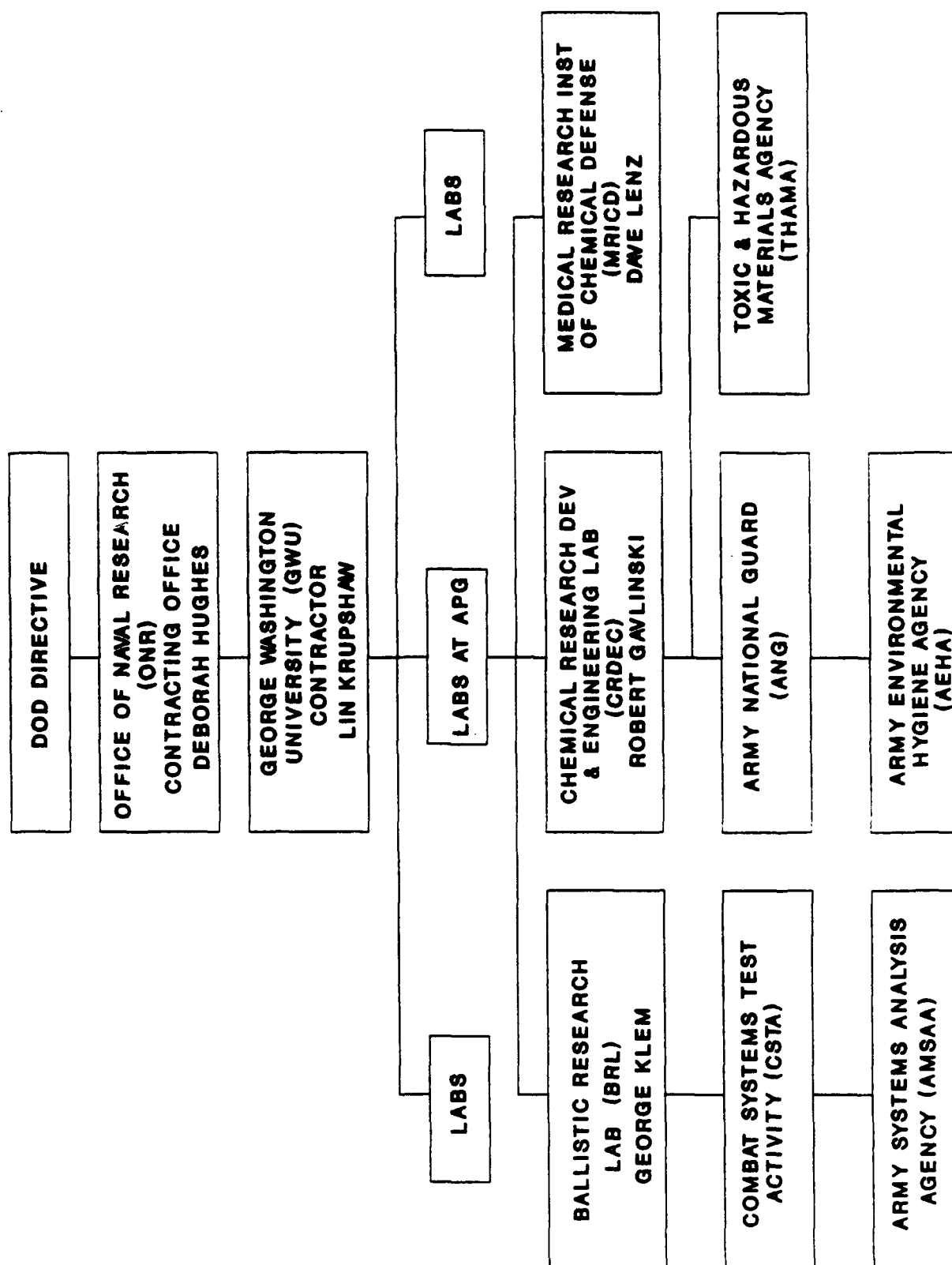
APPENDIX C  
ORDER OF PRESENTATION

## Order of Presentation

VG 1	Header
VG 2	Order of Presentation
VG 3	Overview (Figure 1)
VG 4	Statistics by Quantity by Sex, Minority and Academic Grade (Table 1)
VG 5	Statistics by School (Table 2)
VG 6	Observations of Program (Figure 2)
VG 7	Current Status in College Career (Table 3)
VG 8	CRDEC Apprentice Accomplishments (Table 4)
VG 9	Problems and Solutions (Figure 3)
VG 9A	Mentor Participation (Figure 4)
VG 10	Benefits (Figure 5)
VG 10A	Benefits of Apprenticeship Program (Figure 5 Alternative)

## **ORDER OF PRESENTATION**

- **OVERVIEW OF APPRENTICE PROGRAM  
AT CRDEC**
- **1984-1992 STUDENT & SCHOOL STATISTICS**
- **OBSERVATIONS OF THE PROGRAM**
- **APPRENTICE'S CAREER FOLLOWUP**
- **EXCERPTS OF TECHNICAL REPORTS**
- **CONCLUSION**



## **OBSERVATIONS OF THE PROGRAM**

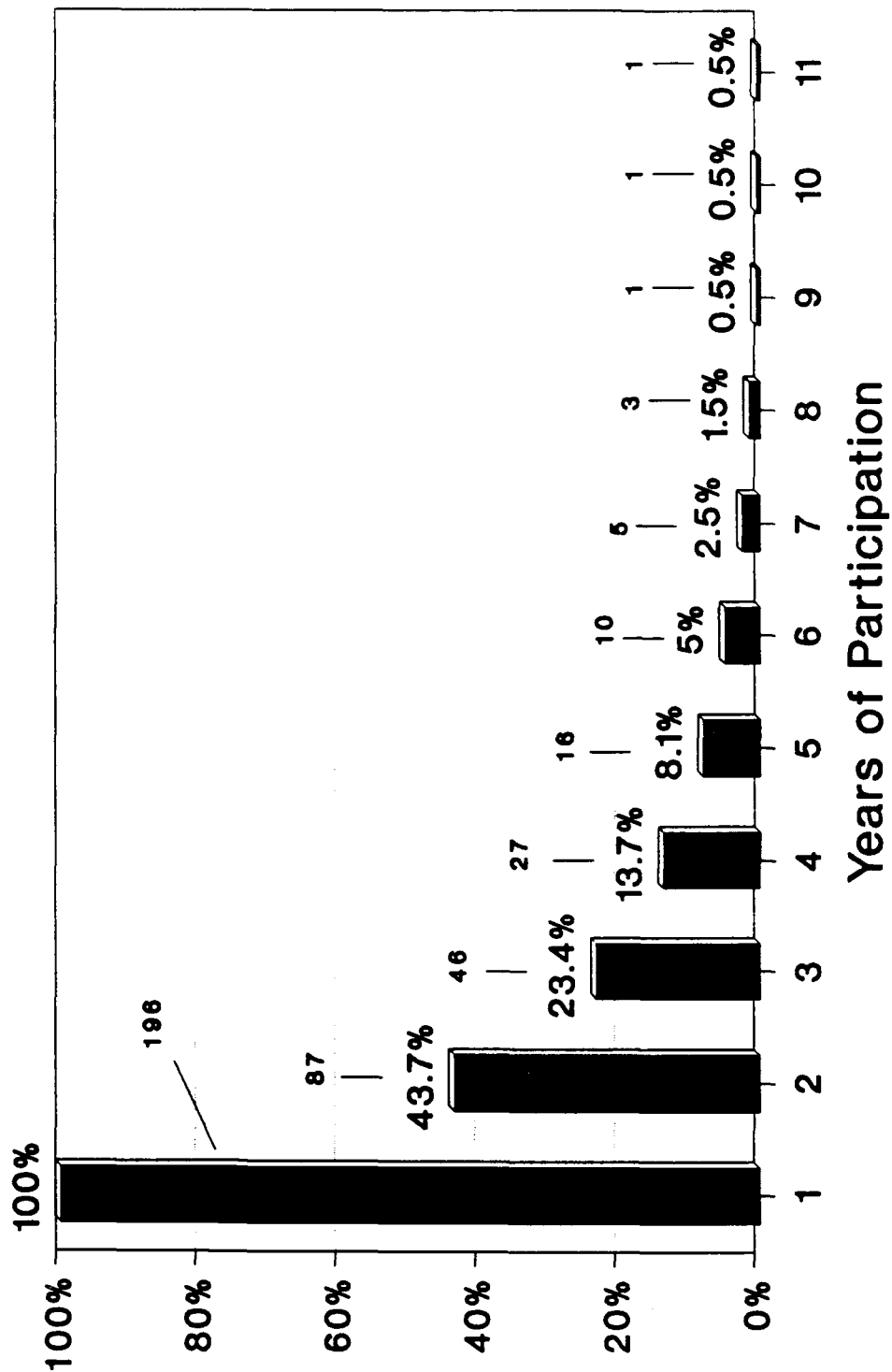
- **HARFORD COUNTY (MD) PREDOMINANT**
- **APPROX 50/50 RATIO BOY TO GIRL**
- **APPROX 150/50 RATIO APPLICANTS TO APPOINTMENTS**
- **JUNIORS & SENIORS PREDOMINATE FOR SELECTION**
- **PUBLISHED REPORTS ARE IMPORTANT STUDENT GOAL**
- **STIPEND IS ADEQUATE METHOD OF COMPENSATION**
- **SCIENTIFIC STAFF FREED OF ROUTINE TASKS**
- **MINORITY PROGRAM NOT A PREDOMINANT FACTOR**
- **SCHOOLS & MENTORS FORM TECHNICAL BONDS**
- **STUDENTS REPEAT AT COLLEGE LEVEL  
AS CONTRACTORS**
- **STUDENT'S CAREER GOALS ARE FORMALIZED**
- **SUMMER INTERVAL OF 8 WEEKS IDEAL**

## PROBLEMS AND SOLUTIONS

- STUDENTS CAUGHT "HACKING" ON ELECTRONIC MAIL BY SYSTEMS SECURITY
- THIRTEEN STUDENTS WERE SUMMARILY TERMINATED AT THE SIXTH WEEK
- PARENTAL UPROAR
- PERSONAL CONFERENCE AMONG STUDENT, PARENT AND COORDINATOR
- STUDENTS CONFRONTED WITH PRINTED "HACKING" DOCUMENTATION IN PRESENCE OF PARENT - MOST ADMITTED TO FAULT
- PARENTS WERE REQUIRED TO ACCEPT RESPONSIBILITY FOR CHILDREN IN WRITING
- AGREEMENT REACHED, STUDENTS WERE RE-APPOINTED AND COMPLETED THE PROGRAM IN THAT YEAR
- SINCE 1988 STUDENTS ARE DENIED ACCESS TO ELECTRONIC MAIL



# Percentage of Participation Of 196 Mentors



## **BENEFITS TO CRDEC**

- 8 WEEK INTERVAL FITS SUMMER STAFF SCHEDULE
- RETURN ON INVESTMENT IS 16 TO 1 BY DOLLARS ALONE
- EAGER AND TALENTED WORK FORCE AUGMENTATION

## **BENEFITS TO STUDENT**

- HANDS ON EXPERIENCE
- PUBLISHED PAPER
- STIPEND COMPENSATION
- NETWORKING TO OTHER STUDENTS
- CAREER GOALS SOLIDIFIED
- MENTOR BONDING

## **BENEFITS TO COMMUNITY**

- STEWARDSHIP TO SCHOOLS CONFIRMED

## **BENEFITS OF APPRENTICE PROGRAM**

- **COST PER STUDENT IS LOW (\$1200 FOR 8 WEEKS)**
- **HIGHLY MOTIVATED HELPER TO THE MENTOR**
- **SCIENTIFIC ACCOMPLISHMENTS ARE WORTHWHILE**
- **EASY TO HANDLE THE PROGRAM**
- **CIVILIAN PERSONNEL OFFICE ASSISTANCE NOT REQUIRED**
- **NO MANPOWER SLOTS REQUIRED**

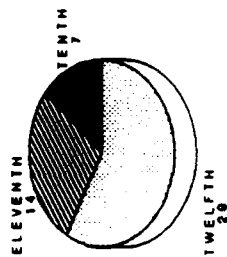
# 1984 APPRENTICESHIP PROGRAM BREAKDOWN BY SEX



**TOTAL 60 STUDENTS**

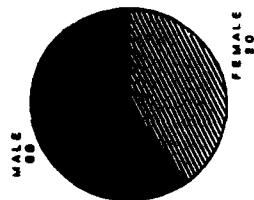
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## 1986 APPRENTICESHIP PROGRAM BREAKDOWN BY GRADE

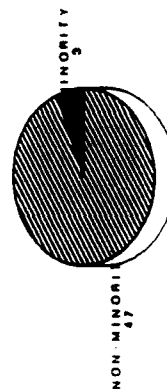


**TOTAL 00 STUDENT NO**

**1986 APPRENTICESHIP PROGRAM  
BREAKDOWN BY SEX**



**1986 APPRENTICESHIP PROGRAM  
BREAKDOWN BY MINORITY STATUS**



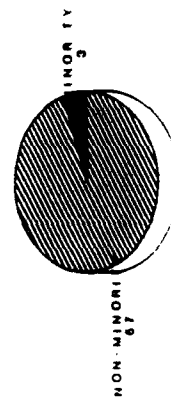
TOTAL 26 07 2009 17 0

[illegible][illegible]

A pie chart showing the distribution of the population by age group. The chart is divided into three segments: a large segment labeled 'ELEVENTH 37' (hatched), a small segment labeled 'TENTH 2' (white), and a medium segment labeled 'TWELFTH 3' (white).

FORM 00 07422070

**1986 APPRENTICESHIP PROGRAM  
BREAKDOWN BY MINORITY STATUS**



**TOTAL 09 87396478**

[illegible]

A pie chart illustrating the distribution of 1000 people across four categories. The chart is divided into four segments: a large hatched segment for 'TWELFTH' (38), a large white segment for 'ELEVENTH' (34), a small white segment for 'TENTH' (9), and a very small white segment for 'EIGHTH' (1).

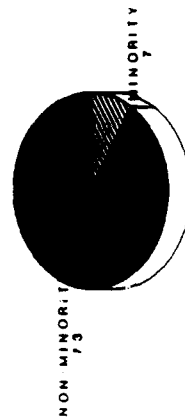
Category	Count
Twelfth	38
Eleventh	34
Tenth	9
Eighth	1

TOTAL NO STUDENTS & TEACHER

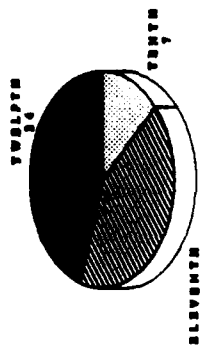
Sex	Percentage
MALE	60
FEMALE	40

**TOTAL 01**

## 1987 APPRENTICESHIP PROGRAM BREAKDOWN BY MINORITY STATUS

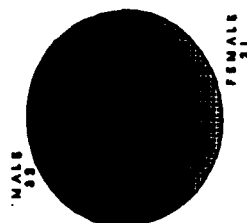
[illegible]

## 1988 APPRENTICESHIP PROGRAM BREAKDOWN BY GRADE

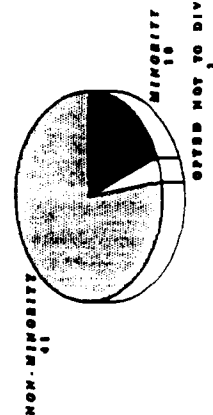


**TOTAL 59 STUDENTS**

# 1988 APPRENTICESHIP PROGRAM BREAKDOWN BY SEX



**1988 APPRENTICESHIP PROGRAM  
BREAKDOWN BY MINORITY STATUS**

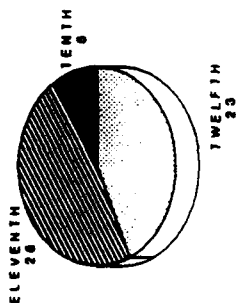


**TOTAL 33 STUDENTS**

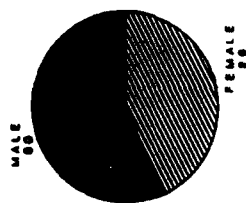
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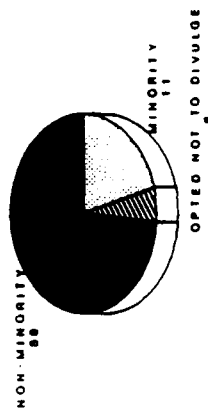
## 1989 APPRENTICESHIP PROGRAM BREAKDOWN BY GRADE



**1980 APPRENTICESHIP PROGRAM  
BREAKDOWN BY SEX**

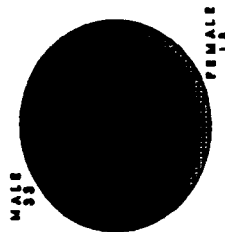


**1989 APPRENTICESHIP PROGRAM  
BREAKDOWN BY MINORITY STATUS**

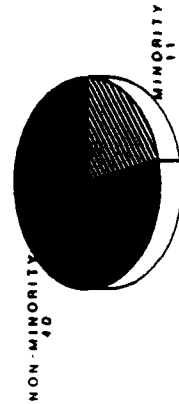
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Sex and Age Group	Percentage
Male 15-64	44.1%
Female 15-64	38.1%
Male 65+	10.8%
Female 65+	7.0%

**1991 APPRENTICESHIP PROGRAM  
BREAKDOWN BY SEX**

## 1991 APPRENTICESHIP PROGRAM BREAKDOWN BY MINORITY STATUS

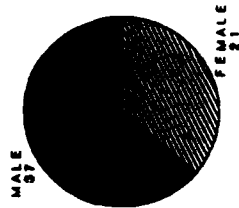


**GRADE SEX MINORITY**

[illegible]

41

### 1992 APPRENTICESHIP PROGRAM BREAKDOWN BY SEX



Response	Percentage
NON-MINORITY	42
MINORITY	10
OPINED NOT TO DIVULGE	48

TOTAL 03 21 JUNE 70

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